

**APPLICATION  
FOR  
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LETTERS  
PATENT**

**METHOD AND APPARATUS FOR  
AUTOMATICALLY CREATING DATABASE FOR  
USE IN AUTOMATED MEDIA RECOGNITION  
SYSTEM**

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**METHOD AND APPARATUS FOR AUTOMATICALLY CREATING  
DATABASE FOR USE IN AUTOMATED MEDIA RECOGNITION SYSTEM**

**RELATED APPLICATIONS**

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 60/273,146, filed March 2, 2001 with the same title and by the same inventors and assigned to the same Assignee.

[0002] This application is related to U.S. Patent Applications Nos. 09/671,571 entitled "Method and System for Purchasing Pre-Recorded Music" filed on September 27, 2000 by the same inventors; and 09/734,949 entitled "Method and System for Interacting with a User in an Experiential Environment" filed on December 12, 2000 by the same inventors. This application is also related to U.S. Provisional Patent Application No. 60/222,023 entitled "Method and System for Recognizing Sound and Music Signals in High Noise and Distortion" filed on July 31, 2000 also by some of the same inventors. Each of these patent applications is hereby incorporated by reference as if repeated herein in its entirety, including the drawings.

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Docket: 1800/3

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#### BACKGROUND OF THE INVENTION

[0004] The present invention relates generally to methods and apparatuses for automatically identifying media samples, and more particularly to a method and apparatus for automatically identifying a media sample based on a database of known media files by comparing certain aspects of the media sample to similarly obtained aspects of the known media files.

[0005] The related applications disclosed various methods and apparatuses for identifying media samples, and applications for such identification. At the heart of these methods and apparatuses is a database of known media files. Creating the database is an expensive proposition. Buying a single copy of all known media files and all new ones as they are created while effective is probably cost prohibitive. Simply making copies of media files while also effective may in certain instances violate copyright laws in some countries. Moreover, the uncertainty of whether certain acts do in fact violate copyright laws coupled with the fact that copyright laws vary, sometimes significantly, from country to country, makes it difficult to invest in and/or implement a system or method that relies upon use of unlicensed media.

[0006] The present invention is therefore directed to the problem of developing a method and apparatus for automatically creating a database of known media files at low cost and without violating any copyright laws.

SUMMARY OF THE INVENTION

[0007] The present invention solves these and other problems by providing method and apparatus for interacting with an on-line community providing access to a large number of media files and a database of metadata related to the media files available from its users to process segmented portions of each media file to create additional metadata that can be subsequently used to create constellations and fingerprints for each media file for use in the recognition algorithm to be employed. By creating processed metadata from each file that can be then stored for use in a recognition database or further processed, for use in the algorithm being actually employed by the recognition process at a later date, the present invention probably avoids violating copyright protections, as the processed metadata may not be protectable and as no copy of the original file is created, even temporarily, in the process of the present invention. Thus, the present invention enables an automatic and inexpensive technique for creating the necessary database for use in the media recognition systems set forth in the above-mentioned U.S. Patent Applications.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG 1 shows a block diagram of an exemplary embodiment of a system according to one aspect of the present invention.

[0009] FIG 2 shows a block diagram of a second exemplary embodiment of a system according to another aspect of the present invention.

[0010] FIG 3 shows a block diagram of a third exemplary embodiment of a system according to another aspect of the present invention.

DETAILED DESCRIPTION

[0011] It is worthy to note that any reference herein to “one embodiment” or “an embodiment” means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the invention. The appearances of the phrase “in one embodiment” in various places in the specification are not necessarily all referring to the same embodiment.

[0012] The present invention provides an automatic technique for creating a database of media files against which media samples are compared to identify the media samples. An exemplary embodiment of the present invention uses an existing system indirectly accessed via an existing company. An exemplary service, <http://www.CDDB.com> actually operates in the “background” – people who insert a CD in their PC usually do it through third parties, such as MusicMatch or Winamp. This service (<http://www.cddb.com>) is also known as Gracenote, which has a large community of users, to harvest fingerprints, i.e., processed metadata. The user interface to Gracenote may occur through a third party, such as MusicMatch.com. For the sake of simplicity herein, we will leave out the indirect relationship between the user community and Gracenote.

[0013] Currently, Gracenote has over 1,000 licensees in 35 countries, 20 million unique users a month, and more than 800,000 albums and 10 million songs in its database; hence, Gracenote is a comprehensive and widely accessible platform for delivering worldwide music related content and services. Gracenote is a service paid for by the third party explained above, by and for music fans to identify the music they play. Gracenote’s Content Delivery Engine provides the ability to aggregate and deliver rich

Docket: 1800/3

third-party content that is directly related to music as it is playing. Gracenote's CDKey technology verifies possession of a particular CD and uses it as a key to enable web-based applications, such as music lockers or music service providers. This CDKey technology can even unlock bonus content from any location, including Gracenote-enabled applications, such as media players or websites.

[0014] Several patents describe this service in particular detail, including U.S. Patent No. 5,987,525 and U.S. Patent No. 6,154,773, which relate to features including synchronizing visual content with playback of a musical recording at a local computer that receives the visual content from a remote computer. U.S. Patent No. 6,061,680 relates to a method used to find title and track information in a database by calculating approximate length information based on the number and length of tracks on a recording. U.S. Patent No. 6,161,132 relates to a method of using a first device to control playback of a recording at one or more second devices connected to the first device via a network and transmitting output data related to the recording between the first and second devices. Each of the above four patents is hereby incorporated by reference as if repeated herein in their entirety, including the drawings.

[0015] Users of this service via the above mentioned website are able to obtain metadata from the website based on inserting a CD into a CD player, which then uploads certain information to the server, in particular the number of tracks and associated track lengths. This metadata is then used to identify the particular media and then extract other related metadata from the server related to the identified media, such as artist, genre, etc.

[0016] By using this service, the present invention permits building of the necessary

Docket: 1800/3

database to supplement content derived from directly ripping parameters from media owned by the system.

[0017] According to an exemplary embodiment for use with Compact Disks (CDs), when a user of the CDDB website inserts a CD into a CD player hooked up to a data archiving service, constellation or fingerprint parameters are extracted from the tracks on the CD and then sent to the data archiving service. The raw parameter data may then be further processed, either immediately or at some later time (including after a prolonged storage) into landmark/fingerprint pairs for storage in the recognition database. The raw parameter data may be optionally stored in case a new revision of the algorithm for enhanced recognition is available. The enhanced recognition algorithm could use the stored raw parameter data to generate new enhanced fingerprints, whereby access to the original source of raw data (i.e., the original CD) is not necessary for minor algorithm updates (e.g., linkage updates).

[0018] In the case of songs or media not already in the database, another aspect of the invention provides for this, which aspect also takes care of major algorithm updates as well. Rather than extracting the parameters each time and forwarding them, the remote client first queries the database to determine if the song already exists in the database. If not, then the remote client extracts and forwards the necessary parameters. If the song is already in the database, the remote client determines if the remote client is using a version of the algorithm that is more up-to-date than the version used on the song previously stored in the database. If so, then the remote client performs the parameter extraction.

[0019] Another aspect of the present invention allows the remote client to update its

Docket: 1800/3

algorithm to the latest version by either: (1) updating parameters controlling the extraction; or (2) downloading a code update embodying the updated parameter extraction. This process is accomplished before updating the song.

[0020] Of course, the raw parameter data being sent over should be associated with the track "metadata" information about the song in order for it to be identified. This could be accomplished by: (1) extracting identifying parameters that could be used to look up the metadata in a metadata database, such that the metadata database could be queried immediately or later. If immediately, then: (2a) the retrieved metadata is sent to the recognition server, otherwise if later: (2b) the unique ID is sent to the recognition server, whereby the database can be subsequently queried.

[0021] Hence, for example, a small piggyback program could be distributed with the CDDDB SDK, so that CDDDB clients could incorporate the raw parameter extraction process, so that raw parameters could be extracted when the CDDDB service is used for querying. Or, an extractor could be running independently of CDDDB, such that it derives the parameters for CDDDB to use, but does not actually incorporate CDDDB code. In the latter case, CDDDB is queried after the data packet is received by the recognition database.

[0022] With this method, the database may be incrementally updated such that songs with older versions of the algorithm may be updated when a new algorithm is available, and the CD is presented by a user, allowing new raw parameters to be extracted. There is the issue that the database would have multiple raw parameter formats with algorithms of varying ages. This could be handled by segmenting the recognition landmark/fingerprint database, such that songs with the same version of parameter are grouped together. Then, an incoming song needs to be analyzed using each of the various fingerprinting algorithm



versions in use. Corresponding queries into segments of the database are made with the proper fingerprint version. As updated parameters for a song trickle in, the song is bumped up into its proper version category. The updates may be forced by directly extracting parameters from songs that are immediately available, for example if the original source material is available in a readily accessible music archive. If the song is not available then the song is updated opportunistically as some user with an updated extractor presents the song to the extractor. Over time, the majority of the songs attain the most recent format.

[0023] An exemplary embodiment of a process 10 according to one aspect is shown in FIG 1 for use with audio media, such as compact disks (CDs). The user places a CD in his CD player 1. A software process 3 installed on the user's personal computer 2, to which is connected the CD player 1, extracts the constellation or "raw parameters" from the CD tracks as the CD plays, or under control of the software process. These raw parameters are then transmitted via the Internet 4 (or other computer network) to a server 5 coupled to a recognition database 6. The raw parameters are stored in the database 6. At some point in time, the raw parameters are processed into fingerprint/landmarks (e.g., using linkage) using another software process 7 and then stored either back in the database 6 or in random access memory (RAM) for use during a subsequent recognition process. This process, however, requires manual identification of the CD.

[0024] Turning to FIG 2, shown therein is a second exemplary embodiment of a process 20 according to another aspect of the present invention. This process 20 relies upon the identification capabilities of the Gracenote service or other similar service that can identify a CD when placed in one's CD player 1. Simultaneous to the uploading of

Docket: 1800/3

the constellation or raw parameters to the recognition database 6, the track length and number of tracks are sent to the Gracenote server 8 for identification by the CDDB software 9 (as disclosed in the above mentioned patents), the result of which is forwarded to the recognition database 6. The result can either be returned to the user via the same path the request arrived and then uploaded at the end of the raw parameter extraction process, or forwarded directly to the recognition database 6 via the Internet 4 and server 5.

[0025] Thus, as before a user places a CD in the CD player 1. The CD is identified via the CDDB software 9. Metadata for that particular CD is provided to the recognition server 5 along with the identification for storage in the recognition database 6 in a record associated with the received constellation or raw parameters for that particular CD. As before, the constellation or "raw parameters" are extracted and transmitted to the recognition database 6 via the Internet 4. This processed metadata is then stored, and subsequently further processed into fingerprint/landmarks (e.g., using linkage). Finally, the subsequently processed metadata is stored for use by the recognition service. This process, however, may result in redundant data arriving at the recognition database 6.

[0026] Turning to FIG 3, shown therein is an exemplary embodiment of another process 30 according to another aspect of the present invention. This process 30 performs a check prior to extracting the constellation or raw parameters to determine whether the recognition database 6 currently holds the latest version (i.e., the correctly processed metadata) of the CD in the user's CD player 1. If so, no further action is taken. If not, the data is uploaded in the same manner described previously.

[0027] First, the user's CD is identified 31 and then a check is performed to see if the

Docket: 1800/3

recognition database already has the CD with the most up-to-date raw parameter format.

If the recognition database already contains the most up-to-date raw parameter for the CD at issue, then no further action occurs 32. If the recognition database does not have the particular CD, then the constellation or "raw parameter" extraction process occurs. The resulting constellation or "raw parameters" (i.e., processed metadata) are then transmitted to the recognition database 6, where they are placed in storage and subsequently processed into fingerprint/landmarks (e.g. using linkage). The resulting further processed metadata is stored in RAM for use by the recognition service.

[0028] The above explanation relates primarily to extracting raw parameter data from (physical) CDs inserted in a personal computer. In a similar fashion, one could extract raw parameters using the same process-flows as described from scanning a user's hard drive or tapping into streaming music. The associated metadata would come from either "file embedded info" (e.g., ID3 tags), or could be directly input by the user.

[0029] For those who wish to submit their music on a "voluntary" basis directly to the recognition server, e.g., as the result of an incentive, such as sales commission, etc, the above process would simply upload the constellation or raw parameters independently of any other service. This would be particularly useful for obscure material, such as dance music, deleted items, etc.

[0030] One possible way to accomplish this is by building an interface to a predetermined web site via which fingerprints could be obtained through scanning either a CD or digital file. In this case, duplication of fingerprints would be avoided by quickly comparing the new fingerprint against the existing database. In addition, such an approach would likely not violate copyright laws.

Docket: 1800/3

[0031] Another possible embodiment includes a CD player/ripper device or program with a built-in constellation extractor. One could rip a CD in terms of constellations in about 20-30 seconds. This could happen in the background when nobody is paying attention. The constellation coefficients could be sent to the recognition server to build up the database. As previously noted, this amount of data would be relatively small. Such a ripping program could of course send ID3 tags along with the constellation data.

[0032] Thus far, the discussion has related to the embodiments in which the constellation extraction occurs on the user end side. It is also plausible to assume that this extraction could be done by other constituencies such as:

- the record label (with every new release);
- the artist (when composing a new song); and
- retail store (when a new album is put on the shelf).

[0033] Each of the constituencies mentioned above would probably have an incentive to add the mediafile to the recognition database (e.g., selling more music). Moreover, the recognition service could provide incentives to these constituencies to voluntarily supply this information to the recognition service in the way of directed sales, commissions, etc.

[0034] Although various embodiments are specifically illustrated and described herein, it will be appreciated that modifications and variations of the invention are covered by the above teachings and within the purview of the appended claims without departing from the spirit and intended scope of the invention. For example, while several of the embodiments depict the use of specific data formats and protocols, any formats or protocols may suffice. Moreover, while some of the embodiments describe specific embodiments of computer, clients, servers, etc., other types may be employed by the

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- 13 -